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Reliability in modeling extreme precipitation rain rates supports in progress strategies for the improvement of operational severe weather forecasts and simulations of climate change scenarios

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Since the beginning of the weather numerical models history, rainfall field has been a benchmark. Precipitation is the result of a synergic interaction between microphysical and dynamical processes in the atmosphere, then it requires the numerical models be able to reproduce both of them satisfactory.

While at the early stages of the numerical weather forecast the attention was focused on the large scale precipitation amounts and patterns, nowadays limited area operational models run with spatial resolution that is comparable to the typical mesoscale to miscroscale size of convective phenomena, so it is expected that local extreme precipitation rates are reproduced successfully.

In this work we present the goodness of the of the hourly rainfalls simulated by means of the non-hydrostatic WRF model run at 2 km horizontal resolution over the Alpe-Adria domain, that encompasses the north Adriatic sea, the eastern Alpine ridge and all the plains and valleys in it.

Boundary conditions for the WRF runs are ECMWF operational IFS analyses and the output dataset covers five years, 2012-2016, which is the test part of the fifteen years set of high resolution meteorological fields we are generating for general purposes environmental applications and data distribution. Simulated hourly precipitation rates are compared with rain gauges measurements.

We show that the model is able to reproduce the upper tail of the hourly precipitation amounts and the mesoscale convective patterns over the computational domain matching the climatological differences induced by orography and the air-sea interactions.

This study aims to support a twofold in progress strategy which is leading to the next generation atmospheric modeling: one is the increase of the spatial resolution of the operational global atmospheric models together with their migration into the non-hydrostatic dynamics. The second is the application of limited area models, such as WRF, to downscale global climate change scenarios to sub continental areas. These fruitful perspectives will be discussed as part of the presentation.

The WRF model is one of the environmental models which are run operationally at the Regional Agency for Environmental Protection of Friuli Venezia Giulia region (ARPA FVG), the northeastern most Italian region.